DOCUMENT RESUME

ED 284 535 IR 012 778

AUTHOR Chapman, Shirley
TITLE A Critique on the Computer Literacy Curriculum in Alberta, Canada.
PUB DATE [84]
NOTE 20p.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Computer Literacy; *Computer Science Education; *Curriculum Design; Curriculum Evaluation; Developed Nations; Elementary Secondary Education; Foreign Countries; Junior High Schools
IDENTIFIERS *Alberta; Canada

ABSTRACT

The organizational scheme of the 1984 Alberta Computer Literacy Curriculum and its appropriateness in relation to stated purposes, philosophy, rationale, and goals are examined in this paper, using the junior high school curriculum for illustration. Several conclusions are drawn: (1) the curriculum is well organized; (2) its basic organizational scheme is one of centers (topics) and elements (dimensions of awareness, function, and critical understanding of the topics); (3) objectives correspond to the organizational scheme and advance in difficulty; (4) the organizational scheme is appropriate to the curriculum; (5) flexibility of time is given to the experienced versus the inexperienced student; (6) hands-on computer experience is provided for each student; (7) skills, knowledge, and attitude development are included in the program; and (8) the rationale and philosophy are incorporated into the curriculum. Impending changes in the curriculum are described, and five charts depicting various aspects of the curriculum are appended. (MES)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED284535

A CRITIQUE ON THE COMPUTER LITERACY CURRICULUM IN ALBERTA, CANADA

BY SHIRLEY CHAPMAN
UNIVERSITY OF ALBERTA
SECONDARY EDUCATION
EDMONTON, ALBERTA, CANADA

IR012778

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Shirley Chapman

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

A CRITIQUE ON THE
COMPUTER LITERACY CURRICULUM

Purpose of the Paper

Goodlad (1968:314) writes that "curriculum...is something intended for students, there must a plan specifying and justifying what they are to do and, hopefully, learn." Curriulum as a plan is the focus of this paper.

I will examine the organizational scheme of the Computer Literacy Curriculum (1984) and discuss the appropriateness of it in relation to its stated purposes, philosophy, rationale, and goals. My analysis will focus on several questions. They are: How well did the curriculum adhere to this rationale and philosophy that was developed and stated by the curriculum writers in 1984? What is the organizational scheme? Is the organizational scheme appropriate to the curriculum? Do the objectives correspond to the organizational scheme and do they graduate in difficulty? Is there "hands-on" computer experience for the student? Is there skills, knowledge, and attitude development within the program? Are students given opportunities to program computers? And, will the student gain an understanding of what effect computers have on our society? These questions will form the basis of the analysis of the Computer Literacy curriculum that has been mandated by the province of Alberta since 1984. For the purposes of this analysis, the Junior High Curriculum will be utilitized as a point of focus for examples.

Rationale and Philosophy

> There will be a need for the entire population to be computer literate, and unless such literacy is imparted from early childhood, a substantial part of the population may find that they lack the basic skills needed to get along in their daily lives (Junior High Computer Literacy 1984:2, hereafter to be known as CURRICULUM).

The specific skills, knowledge, and attitudes required to be computer literate will vary with time and with the student's level of computer expertise. The elements that form the basis for the provincial computer literacy program are indicated in the definition:

> To be computer literate one must be able to describe, demonstrate and/or discuss (critically) how computers are used; how computers do their work; how computers are programmed; how to use a computer and how computers affect our society (CURRICULUM 1984:2).

The computer literacy program is based upon the following philosophical assumptions:

> ...all students should have the opportunity to become computer literate;... Interdisciplinary content and examples from various subject fields should be incorporated into the program; ...each student must have 'hands-on' computer experience;...computer literacy encompasses three dimensions: awareness, function, and critical understanding (CURRICULUM 1984:2-3).

ORGANIZATIONAL SCHEME

The CURRICULUM (p.6) states that there are five topics that "the junior high computer literacy program is organized around". These topics are:

> Topic 1: Computer Systems
> Topic 2 Computer Operations
> Topic 3: Computer Programming
> Topic 4: Computer Applications
> Topic 5: The Societal Impact of Computers

When the Program of Studies (pp.12-16) is examined, it becomes apparent that these topics are an integral part of the curriculum. Each of the six topics is assigned a set of objectives with one or two corresponding goals also listed. (See the appendix, figure 1) These topics can be seen as centers around which the curriculum is organized.

The six topics are sequenced in difficulty beginning with the simplest, COMPUTER SYSTEMS. In a study of Computer Systems the student should become aware of basic computer operations and terminology as well as develop an appreciation of the development of computer systems. Later, in topic 3 (COMPUTER PROGRAMMING), the student is given a "hands-on" experience in problem-solving. This "hands-on" experience continues in topic 4, COMPUTER APPLICATION where the student engages in programming. Finally in topic 5, THE SOCIETAL IMPACT OF COMPUTERS, the student develops critical understandings of the impact computers have on society.

In the rationale and philosophy section of the CURRICULUM (p.3), the developers state that "computer literacy encompasses three dimensions: Awareness, Function, and Critical Understanding." When the Core Components of the Program of Studies (pp.12-16) is examined, it is evident that the three terms are an integral part of the Core Components because a special column labelled Dimension Status is found for each topic or center. In this column the first letter of each of the three terms: A for AWARENESS, F for FUNCTION; and U for CRITICAL UNDERSTANDING, designates the status of each of the objectives. It appears that

these three dimensions are the three elements of the underlying organizational scheme of this curriculum. This conceptal connection can be seen more graphically in figure 2 in the appendix.

The three elements (Awareness, Functional, and Critical Understanding) are sequenced in difficulty, beginning with an overall awareness of computers in society, including their applications in everyday life. The overall awareness of computer in society is followed by a functional or working knowledge of computers and their capabilities for problem-solving. Finally, the curriculum indicated a critical understanding of the implications and effects of the use of computers in society and study of how computers can directly and indirectly affect the individual. In total, five centers and three elements form the underlying organizational scheme for this curriculum.

Having determined the centers and elements and how the centers are directly linked to the eight goals of the curriculum, it is important to examine the objectives that are listed under each center to discern if they are also consistent with the goals, centers, and elements of the curriculum.

OBJECTIVES

Not all of the centers will be examined in this paper. Three of them have been chosen as they are representive of the five. The first center, is COMPUTER SYSTEMS, has two goals. These goals are 1) to develop student understanding of basic computer operations and terminology and 2) to develop an appreciation of the technological development of computer systems. The major objective and three minor objectives of computer systems are:

Students will: (this statement is common to all of the objectives)

1.0 describe the basic operations and history of computer systems.
- 1.1 recognize and use basic computer terms.
- 1.2 briefly describe the historical development of computer systems.
- 1.3 describe a computer system.

Upon reviewing the goals it is obvious that the objectives not only fit the two goals for the unit but also would apply to the idea of the center called COMPUTER SYSTEMS. Each of these four objectives belong to the AWARENESS element. The student is not expected to use the computer, but simply to be able to recognize a number of specified terms, to describe a brief historical development of the computer, and finally to describe various types of computers and their relationships between the various components and operations. Therefore, the objectives are consistant with the criteria of the two goals, the center and element.

The third center, COMPUTER PROGRAMMING, has one goal: to have students appreciate that effective problem-solving with computer systems requires the application of logical thought processes and the development of the skills required for a holistic, systematic approach to problem-solving. Within this center, there is one major objective and four minor ones:

3.0 follow an orderly sequence of steps in developing a program to solve a particular problem.
- 3.1 recognize that BASIC is only one of the languages used on micros
- 3.2 outline a procedure (algorithm) to solve a problem.

3.3. code a given procedure (algorithm) into a computer program
3.4 be able to analyze computer programs.
3.5 display confidence in his/her ability to use and control computers.

All five of these objectives accommodate the purpose of the center COMPUTER PROGRAMMING. The student is expected to recognize that there are other computer languages; to develop skills in defining problem, recognizing flow chart symbols, drawing flow charts; to develop skills in computer usage; to develop skills to test and debug programs; and finally to design and demonstrate a computer program. However, there is more than one element portrayed here. Objective 3.1 belongs to the element AWARENESS because the student is only expected to recognize that there are various computer languages. The other objectives, 3.2,3.3,3.4 and 3.5 belong to the element FUNCTIONAL. Each one of these involve a skill: a skill to read and develop flow charts; skills of performance on the computer; skills to test and debug simple programs; and lastly a skill to design their own program. All of these objectives requires a hands-on experience on the computer. Also these objectives expand the goal's purpose. To summarize, these objectives affirm the goal, the center and two elements: AWARENESS AND FUNCTIONAL.

The fourth topic is COMPUTER APPLICATIONS. It has two goals: 1) to have students appraise the applications, limitations, and capabilities of computer systems and 2) to promote a greater understanding and increase utilization of computer technology in

other subject areas. This topic has one major objective and five minor objectives:

4.0 describe the basic applications, limitations, and capabilities of computers.
- 4.1 identify specific tasks performed by computers in various areas of society.
- 4.2 describe computer capabilities and limitations.
- 4.3 identify tasks which are not suited to computer applications.
- 4.4. describe why a computer can only do what people instruct it to do.
- 4.5 manipulate information using a commercially prepared interactive data processing program.

All six of the these objectives respond to the center, COMPUTER APPLICATIONS, and its two goals. Students will examine examples of areas where computer are used, e.g. banking, manufacturing, transportation, government, recreation, and libraries. They will describe the tasks that computers are best able to perform, e.g. tasks of speed, accuracy, repeated operations, and processing large amounts of data. Students will also list tasks that the computer is not suited for, e.g. tasks that calculators do well, and non-repetitive calculations. Students will be able to describe why computers cannot make independent decisions. Finally, students will demonstrate their ability to use a word processor, data base management system, or an electronic spreadsheet.

Although all of these objective affirm the center, they are not labelled the same element, in fact, all three elements are

represented: objectives 4.1 and 4.2 are labeled AWARENESS elements; 4.3 and 4.5 objectives are labeled FUNCTIONAL elements; and 4.4 objective is labeled a CRITICAL UNDERSTANDING element. To summarize the fourth topic the objectives advances the two goals, the center and the three elements.

Not only do the objectives harmonize with the eight goals, the five centers and each element also progresses in difficulty from center to center. For example, as shown in figure 3 in the Appendix, it is apparent as the FUNCTIONAL element is traced across the three centers where it is featured that student are expected to increase their skills in the use of the computer. The COMPUTER OPERATION center expects students to learn to operate the computer at a very elementary level, e.g. Disk Operation, while at the COMPUTER PROGRAMMING center the student is expected to solve algorithm problems and code a given procedure. At the COMPUTER APPLICATION center the student is expected to manipulate commercially prepared programs. The feature of progressive difficulty is upheld across the five centers with all three elements.

Another feature of the three elements is seen when examining the elementary, junior high, and high school curricula. The three elements have a different emphasis in each curriculum. In the elementary school, the AWARENESS element is emphasized over the two elements. In the junior high school the FUNCTIONAL element has the greatest emphasis. And in the high school, the CRITICAL AWARENESS element has the greatest stress. (See appendix figures 2 and 4.)

There are also provisions for differences in student background built into two of the three curricula. In the junior high and high school curriculum, different times are assigned for the student with no previous computer experience and the student with computer experience. (See appendix for figure 5.) For example, in the junior high curriculum in topics 2 and 3 the range is from 30% to 50%. In the high school curriculum in topics 3,4, and 5 the range is from 45% to 65%, depending on the student's experience.

The time given to the topics also changes depending on the curriculum and its emphasis. For example, in the junior high curriculum which emphasizes the FUNCTIONAL element, topics 2 and 3 are assigned up to 50% of the total class time. In high school, where the emphasis is on the CRITICAL AWARENESS element, 65% of the total class time is assigned topics 4,5, and 5. (See figure 5 in the appendix.)

DISCUSSION

It would appear that this 1984 Computer Literacy curriculum is well organized. Its basic organizational scheme is one of centers and elements where each of the goals is applied to the centers. The objectives respond to the centers and the elements, while advancing in difficulty from center one to center five. The organizational scheme is appropriate to the curriculum. Flexibility of time is given to the experienced versus the nonexperienced student; and "hands-on"computer experience is provided for each. Also, a different emphasis is placed on each

of the three curricula based on the different elements. One element is emphasized in each of levels of the curriculums. There is also skills, knowledge, and attitude development within the program. Upon reflecting on the rationale and philosophy of the curriculum, it is obvious that both the rationale and the philosophy are truly incorporated into the curriculum.

Although the Computer Literacy Curriculum is well designed the curriculum is under review by Alberta Education. This is the first time in the history of provincial curriculum that a program is under review so soon after it was implemented in the educational system. The reason indicates the rapid changes occurring within the technology of the computer itself, rather than a weakness in curriculum design. Changes are occurring at a rakish speed.

When I spoke to Wayne Blair and Terry Kornaham at Alberta Education about the review and the impending changes, they were most helpful. Terry suggested that aspects of the present curriculum would be kept. These were the elements (AWARENESS, FUNCTIONAL, AND CRITICAL UNDERSTANDING)and a number of the specific topics, e.g. Computer Systems, Computer Operations, Computer Programming, and Computer Applications. However, Terry reported that these topics would not be assigned the same proportional time as in the current curriculum. The would also be a different emphasis placed on each one and a host of new topics might be assigned to the curriculum.

To be specific, Terry suggested that not all students in the province have the same background, skill level or attitudes in the use of computers. There are many students who are far more sophisticated in these skills than this present curriculum is addressing. Terry felt that the new curriculum should retain a number of the same objectives. For example, in Topic 1 COMPUTER SYSTEMS, students who have never "turned on" a computer would still be served. Another example would be in the present High School Curriculum under COMPUTER APPLICATION objective 4.2 which states: "students should be able to describe ways in which information may be retrieved from data bases." This objective lends itself to the retrieval and sending of data using television, telephone, satellite, teletex and other retrieval bases.

A third example, also from the High School Curriculum, is objective 4.5 which states: " student should be able to manipulate information using a commerically prepared interactive data processing program." This objective indicates students should become skillful with interactive data processing packages in areas of word processing, graphics, spread sheets and utilities (e.g. Pin Point). However, Terry indicated that these objectives with their extended knowledge and skill components would not be retained by the high school, but would rather be spread to the other two lower levels.

A third area under consideration is the integration of computer science to other subjects areas of the school program. Terry was adamant that computers not become the focus of the

learning, but rather that computers are tools to be used in the school like a pen or pencil.

What do these new ideas from Alberta Education mean to the organizational scheme of the curriculum? The elements will remain the same; however, they will not necessarily indicate the same proportionate emphasis in the three levels of schooling as in the 1984 curriculum. The centers, for the most part, will also remain; but, once again they may indicate a different poroportion of time assigned to each center. The definition of computer literacy will undergo a name change. The new name will be COMPUTER SCIENCE. As well, the philosophy will be revamped to incorporate the new, or extended, emphases of the program. Finally, the gaols of the program must be reviewed to ensure the "new look" of the curriculum is seen in these goals. At this point in time these appear to be the 'changes' that will be part of the new curriculum, COMPUTER SCIENCE. However, the review has just begun and it will not be known what the changes are until the curriculum has been approved by the Department of Education.

APPENDIX

Figure 1

THE SIX TOPICS AND EIGHT GOALS AND THEIR RELATIONSHIP

Computer Systems is directly related to goals 1,2. which states:

1. To develop student understanding of basic computer operations and terminology.
2. To develop an appreciation of the technological development of computer systems.

Computer Operations is directly related to goal 3 which states:

3. To develop student skills, attitudes and interests which facilitate the use of computer systems.

Computer Programming is directly related to goal 4 which states:

4. To have students appreciate that effective problem-solving with computer systems requires the application of logical thought processes and the development of the skills required for a holistic, systematic approach to problem-solving.

Computer Application is related to goals 5 and 8 which states:

5. To have students appraise the application, limitations and capabilities of computer systems.
8. To promote a greater understanding and increase utilization of computer technology in other subject areas.

The Societal Impact of Computers is directly related to goals 6 and 7 which states:

6. To have students assess the current and potential impact of computer systems on society.
7. To develop student skills, attitudes and interests that will facilitate adaptation to changes in the workplace due to technological developments.

Figure 2

COMPUTER LITERACY CURRICULUM CHART

Elements \ Centers	COMPUTER SYSTEM	COMPUTER OPERATIONS	COMPUTER PROGRAMMING	COMPUTER APPLICATION	SOCIETAL IMPACT OF COMPUTER
AWARENESS	1.1 * + ^ 1.2 * + ^ 1.3 * + ^ 1.4 * 1.5 * 1.6 * 1.7 * 1.8 * 1.9 * 1.10*	2.2 * 2.4 *	3.1 * + ^ 3.2 ^ 3.3 ^	4.1 * + ^ 4.2 * + ^	
FUNCTIONAL		2.1 * + ^ 2.2 * + ^ 2.3 * + 2.4 *	3.2 * + 3.3 * + ^ 3.4 * + ^ 3.5 * + ^	4.3 + 4.5 + ^	
CRITICAL UNDERSTANDING				4.3 * ^ 4.4 * + ^ 4.5 *	5.1 * + ^ 5.2 * ^ 5.3 * ^ 5.4 ^ 5.5 ^ 5.6 ^

Legend- Elementary - *; Junior High School- +; High School -^

Figure 3

AN EXPANSION OF THE FUNCTIONAL ASPECT
OF THE JUNIOR HIGH CURRICULUM PROGRAM

COMPUTER OPERATIONS:

The Student will:

2.1 Demonstrate responsible behavior in using a computer system.

2.2 Utilize system commands with prepared programs and available hardware.

2.3 Demonstrate knowledge of the Disk Operaating System.

COMPUTER PROGRAMMING:

3.2 Outline a procedure (algorithm) to solve a problem.

3.3 Code a given procedure (algorithm) into a computer program.

3.4 Be able to analyze computer programs.

3.5 Display confidence in his/hers ability to use and control computers.

COMPUTER APPLICATIONS:

4.3 Identify tasks which are not suited to computer applications.

4.5 Manipulate information using a commercially prepared interactive data processing program.

Figure 4

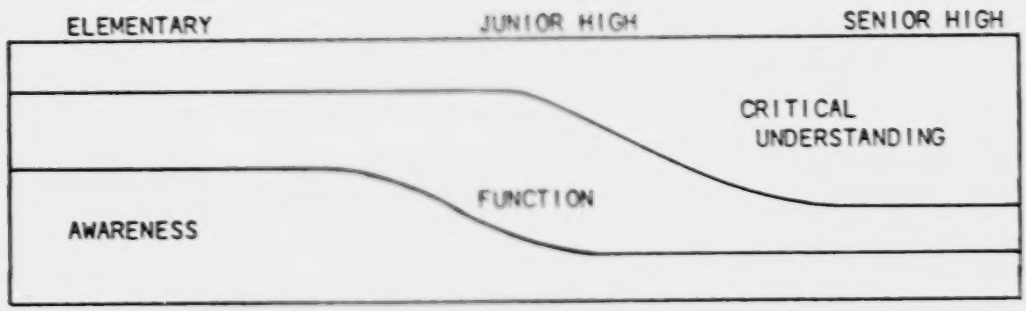

Figure 5

PROVISIONS FOR DIFFERENCES IN STUDENT BACKGROUNDS

TOPICS	ELEMENTARY SCHOOL	JUNIOR HIGH SCHOOL	SENIOR HIGH SCHOOL
1.	20%	5%	
2.	20%	30-50%	25-45%
3.	20%		
4.	20%	15-30%	45-65%
5.	20%	15%	
6.			

The first figure represents the time given to students with no previous computer experience, while the second figure represents the time given to students with previous experience.

BIBLIOGRAPHY

Goodlad, John I. (1968) Toward Improved Curriculum Organization. In E.C.Short and G.D. Marconnit (eds), Contemporary Thought on Public School Curriculum. (pp. 314-323). Dubuque, Iowa: Wm.C. Brown Company Publisher.

Junior High Computer Literacy. Alberta Education, 1984.